SEQUENCE LISTING

<110> Nicolaides, Nicholas C
        Grasso, Luigi
        Sass, Philip M

<120> CHEMICAL INHIBITORS OF MISMATCH REPAIR

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<140> 00/000,000
<141> 2001-01-15

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<170> PatentIn Ver. 2.1

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<213> Artificial Sequence

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        primer

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     primer

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     primer

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     primer

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<210> 7

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<211> 22
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      primer

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<210> 8
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<223> Description of Artificial Sequence:oligonucleotide
      primer

<400> 8
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<210> 9
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<212> DNA
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<223> Description of Artificial Sequence:oligonucleotide
      primer

<400> 9
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<210> 10
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<213> Artificial Sequence

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      primer

<400> 10
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      primer

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<210> 14
<211> 859
<212> PRT
<213> Mus musculus

<400> 14
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Pro Ile Asp Gly Lys Ser Val His Gln Ile Cys Ser Gly Gln Val Ile
             20                  25              30

Leu Ser Leu Ser Thr Ala Val Lys Glu Leu Ile Glu Asn Ser Val Asp
         35                  40                  45

·Ala Gly Ala Thr Thr Ile Asp Leu Arg Leu Lys Asp Tyr Gly Val Asp
      50                  55                  60

Leu Ile Glu Val Ser Asp Asn Gly Cys Gly Val Glu Glu Glu Asn Phe
 65                  70                  75                  80

Glu Gly Leu Ala Leu Lys His His Thr Ser Lys Ile Gln Glu Phe Ala
             85                   90                  95

Asp Leu Thr Gln Val Glu Thr Phe Gly Phe Arg Gly Glu Ala Leu Ser
             100                 105                 110

Ser Leu Cys Ala Leu Ser Asp Val Thr Ile Ser Thr Cys His Gly Ser
         115                 120                 125

Ala Ser Val Gly Thr Arg Leu Val Phe Asp His Asn Gly Lys Ile Thr
     130                 135                 140

Gln·Lys Thr Pro Tyr Pro Arg Pro Lys Gly Thr Thr Val Ser Val Gln
145                 150                 155                 160

His Leu Phe Tyr Thr Leu Pro Val Arg Tyr Lys Glu Phe Gln Arg Asn
             165                 170                 175

Ile Lys Lys Glu Tyr Ser Lys Met Val Gln Val Leu Gln Ala Tyr Cys
             180                 185                 190

Ile Ile Ser Ala Gly Val Arg Val Ser Cys Thr Asn Gln Leu Gly Gln
         195                 200                 205

Gly Lys Arg His Ala Val Val Cys Thr Ser Gly Thr Ser Gly Met Lys
     210                 215                 220

Glu Asn Ile Gly Ser Val Phe Gly Gln Lys Gln Leu Gln Ser Leu Ile
225                 230                 235                 240

Pro Phe Val Gln Leu Pro Pro Ser Asp Ala Val Cys Glu Glu Tyr Gly
             245                 250                 255
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5

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Leu Ser Thr Ser Gly Arg His Lys Thr Phe Ser Thr Phe Arg Ala Ser
            260               265               270

Phe His Ser Ala Arg Thr Ala Pro Gly Gly Val Gln Gln Thr Gly Ser
        275               280               285

Phe Ser Ser Ser Ile Arg Gly Pro Val Thr Gln Gln Arg Ser Leu Ser
    290               295               300

Leu Ser Met Arg Phe Tyr His Met Tyr Asn Arg His Gln Tyr Pro Phe
305               310               315               320

Val Val Leu Asn Val Ser Val Asp Ser Glu Cys Val Asp Ile Asn Val
            325               330               335

Thr Pro Asp Lys Arg Gln Ile Leu Leu Gln Glu Glu Lys Leu Leu Leu
            340               345               350

Ala Val Leu Lys Thr Ser Leu Ile Gly Met Phe Asp Ser Asp Ala Asn
        355               360               365

Lys Leu Asn Val Asn Gln Gln Pro Leu Leu Asp Val Glu Gly Asn Leu
    370               375               380

Val Lys Leu His Thr Ala Glu Leu Glu Lys Pro Val Pro Gly Lys Gln
385               390               395               400

Asp Asn Ser Pro Ser Leu Lys Ser Thr Ala Asp Glu Lys Arg Val Ala
            405               410               415

Ser Ile Ser Arg Leu Arg Glu Ala Phe Ser Leu His Pro Thr Lys Glu
            420               425               430

Ile Lys Ser Arg Gly Pro Glu Thr Ala Glu Leu Thr Arg Ser Phe Pro
        435               440               445

Ser Glu Lys Arg Gly Val Leu Ser Ser Tyr Pro Ser Asp Val Ile Ser
    450               455               460

Tyr Arg Gly Leu Arg Gly Ser Gln Asp Lys Leu Val Ser Pro Thr Asp
465               470               475               480

Ser Pro Gly Asp Cys Met Asp Arg Glu Lys Ile Glu Lys Asp Ser Gly
            485               490               495

Leu Ser Ser Thr Ser Ala Gly Ser Glu Glu Glu Phe Ser Thr Pro Glu
            500               505               510
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Val Ala Ser Ser Phe Ser Ser Asp Tyr Asn Val Ser Ser Leu Glu Asp
          515   520   525

Arg Pro Ser Gln Glu Thr Ile Asn Cys Gly Asp Leu Asp Cys Arg Pro
          530   535   540

Pro Gly Thr Gly Gln Ser Leu Lys Pro Glu Asp His Gly Tyr Gln Cys
545   550   555   560

Lys Ala Leu Pro Leu Ala Arg Leu Ser Pro Thr Asn Ala Lys Arg Phe
              565   570   575

Lys Thr Glu Glu Arg Pro Ser Asn Val Asn Ile Ser Gln Arg Leu Pro
          580   585   590

Gly Pro Gln Ser Thr Ser Ala Ala Glu Val Asp Val Ala Ile Lys Met
          595   600   605

Asn Lys Arg Ile Val Leu Leu Glu Phe Ser Leu Ser Ser Leu Ala Lys
          610   615   620

Arg Met Lys Gln Leu Gln His Leu Lys Ala Gln Asn Lys His Glu Leu
625   630   635   640

Ser Tyr Arg Lys Phe Arg Ala Lys Ile Cys Pro Gly Glu Asn Gln Ala
              645   650   655

Ala Glu Asp Glu Leu Arg Lys Glu Ile Ser Lys Ser Met Phe Ala Glu
              660   665   670

Met Glu Ile Leu Gly Gln Phe Asn Leu Gly Phe Ile Val Thr Lys Leu
          675   680   685

Lys Glu Asp Leu Phe Leu Val Asp Gln His Ala Ala Asp Glu Lys Tyr
          690   695   700

Asn Phe Glu Met Leu Gln Gln His Thr Val Leu Gln Ala Gln Arg Leu
705   710   715   720

Ile Thr Pro Gln Thr Leu Asn Leu Thr Ala Val Asn Glu Ala Val Leu
              725   730   735

Ile Glu Asn Leu Glu Ile Phe Arg Lys Asn Gly Phe Asp Phe Val Ile
              740   745   750

Asp Glu Asp Ala Pro Val Thr Glu Arg Ala Lys Leu Ile Ser Leu Pro
          755   760   765

7

Thr Ser Lys Asn Trp Thr Phe Gly Pro Gln Asp Ile Asp Glu Leu Ile
    770   775   780

Phe Met Leu Ser Asp Ser Pro Gly Val Met Cys Arg Pro Ser Arg Val
785   790   795   800

Arg Gln Met Phe Ala Ser Arg Ala Cys Arg Lys Ser Val Met Ile Gly
            805   810   815

Thr Ala Leu Asn Ala Ser Glu Met Lys Lys Leu Ile Thr His Met Gly
            820   825   830

Glu Met Asp His Pro Trp Asn Cys Pro His Gly Arg Pro Thr Met Arg
            835   840   845

His Val Ala Asn Leu Asp Val Ile Ser Gln Asn
    850   855

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<211> 3056
<212> DNA
<213> Mus musculus

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gtcttttccc gagagcggca ccgcaactct cccgcggtga ctgtgactgg aggagtcctg 180
catccatgga gcaaaccgaa ggcgtgagta cagaatgtgc taaggccatc aagcctattg 240
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8

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<210> 16
<211> 862
<212> PRT
<213> Homo sapiens
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Pro Ile Asp Arg Lys Ser Val His Gln Ile Cys Ser Gly Gln Val Val
            20                  25                  30


Leu Ser Leu Ser Thr Ala Val Lys Glu Leu Val Glu Asn Ser Leu Asp
        35                  40                  45


Ala Gly Ala Thr Asn Ile Asp Leu Lys Leu Lys Asp Tyr Gly Val Asp
    50                  55                  60
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9

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Leu Ile Glu Val Ser Asp Asn Gly Cys Gly Val Glu Glu Glu Asn Phe
65                  70                  75                  80

Glu Gly Leu Thr Leu Lys His His Thr Ser Lys Ile Gln Glu Phe Ala
            85                  90                  95

Asp Leu Thr Gln Val Glu Thr Phe Gly Phe Arg Gly Glu Ala Leu Ser
            100                 105                 110

Ser Leu Cys Ala Leu Ser Asp Val Thr Ile Ser Thr Cys His Ala Ser
            115                 120                 125

Ala Lys Val Gly Thr Arg Leu Met Phe Asp His Asn Gly Lys Ile Ile
        130                 135                 140

Gln Lys Thr Pro Tyr Pro Arg Pro Arg Gly Thr Thr Val Ser Val Gln
145                 150                 155                 160

Gln Leu Phe Ser Thr Leu Pro Val Arg His Lys Glu Phe Gln Arg Asn
                165                 170                 175

Ile Lys Lys Glu Tyr Ala Lys Met Val Gln Val Leu His Ala Tyr Cys
            180                 185                 190

Ile Ile Ser Ala Gly Ile Arg Val Ser Cys Thr Asn Gln Leu Gly Gln
        195                 200                 205

Gly Lys Arg Gln Pro Val Val Cys Thr Gly Gly Ser Pro Ser Ile Lys
        210                 215                 220

Glu Asn Ile Gly Ser Val Phe Gly Gln Lys Gln Leu Gln Ser Leu Ile
225                 230                 235                 240

Pro Phe Val Gln Leu Pro Pro Ser Asp Ser Val Cys Glu Glu Tyr Gly
                245                 250                 255

Leu Ser Cys Ser Asp Ala Leu His Asn Leu Phe Tyr Ile Ser Gly Phe
            260                 265                 270

Ile Ser Gln Cys Thr His Gly Val Gly Arg Ser Ser Thr Asp Arg Gln
            275                 280                 285

Phe Phe Phe Ile Asn Arg Arg Pro Cys Asp Pro Ala Lys Val Cys Arg
        290                 295                 300

Leu Val Asn Glu Val Tyr His Met Tyr Asn Arg His Gln Tyr Pro Phe
305                 310                 315                 320
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10

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Val Val Leu Asn Ile Ser Val Asp Ser Glu Cys Val Asp Ile Asn Val
                325                 330                 335

Thr Pro Asp Lys Arg Gln Ile Leu Leu Gln Glu Glu Lys Leu Leu Leu
            340                 345                 350

Ala Val Leu Lys Thr Ser Leu Ile Gly Met Phe Asp Ser Asp Val Asn
            355                 360                 365

Lys Leu Asn Val Ser Gln Gln Pro Leu Leu Asp Val Glu Gly Asn Leu
    370                 375                 380

Ile Lys Met His Ala Ala Asp Leu Glu Lys Pro Met Val Glu Lys Gln
385                 390                 395                 400

Asp Gln Ser Pro Ser Leu Arg Thr Gly Glu Glu Lys Lys Asp Val Ser
                405                 410                 415

Ile Ser Arg Leu Arg Glu Ala Phe Ser Leu Arg His Thr Thr Glu Asn
                420                 425                 430

Lys Pro His Ser Pro Lys Thr Pro Glu Pro Arg Arg Ser Pro Leu Gly
            435                 440                 445

Gln Lys Arg Gly Met Leu Ser Ser Ser Thr Ser Gly Ala Ile Ser Asp
    450                 455                 460

Lys Gly Val Leu Arg Pro Gln Lys Glu Ala Val Ser Ser Ser His Gly
465                 470                 475                 480

Pro Ser Asp Pro Thr Asp Arg Ala Glu Val Glu Lys Asp Ser Gly His
                485                 490                 495

Gly Ser Thr Ser Val Asp Ser Glu Gly Phe Ser Ile Pro Asp Thr Gly
            500                 505                 510

Ser His Cys Ser Ser Glu Tyr Ala Ala Ser Ser Pro Gly Asp Arg Gly
            515                 520                 525

Ser Gln Glu His Val Asp Ser Gln Glu Lys Ala Pro Glu Thr Asp Asp
    530                 535                 540

Ser Phe Ser Asp Val Asp Cys His Ser Asn Gln Glu Asp Thr Gly Cys
545                 550                 555                 560

Lys Phe Arg Val Leu Pro Gln Pro Thr Asn Leu Ala Thr Pro Asn Thr
            565                 570                 575
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11

Lys Arg Phe Lys Lys Glu Glu Ile Leu Ser Ser Ser Asp Ile Cys Gln
        580   585   590

Lys Leu Val Asn Thr Gln Asp Met Ser Ala Ser Gln Val Asp Val Ala
        595   600   605

Val Lys Ile Asn Lys Lys Val Val Pro Leu Asp Phe Ser Met Ser Ser
    610   615   620

Leu Ala Lys Arg Ile Lys Gln Leu His His Glu Ala Gln Gln Ser Glu
625   630   635   640

Gly Glu Gln Asn Tyr Arg Lys Phe Arg Ala Lys Ile Cys Pro Gly Glu
            645   650   655

Asn Gln Ala Ala Glu Asp Glu Leu Arg Lys Glu Ile Ser Lys Thr Met
        660   665   670

Phe Ala Glu Met Glu Ile Ile Gly Gln Phe Asn Leu Gly Phe Ile Ile
        675   680   685

Thr Lys Leu Asn Glu Asp Ile Phe Ile Val Asp Gln His Ala Thr Asp
    690   695   700

Glu Lys Tyr Asn Phe Glu Met Leu Gln Gln His Thr Val Leu Gln Gly
705   710   715   720

Gln Arg Leu Ile Ala Pro Gln Thr Leu Asn Leu Thr Ala Val Asn Glu
            725   730   735

Ala Val Leu Ile Glu Asn Leu Glu Ile Phe Arg Lys Asn Gly Phe Asp
            740   745   750

Phe Val Ile Asp Glu Asn Ala Pro Val Thr Glu Arg Ala Lys Leu Ile
        755   760   765

Ser Leu Pro Thr Ser Lys Asn Trp Thr Phe Gly Pro Gln Asp Val Asp
    770   775   780

Glu Leu Ile Phe Met Leu Ser Asp Ser Pro Gly Val Met Cys Arg Pro
785   790   795   800

Ser Arg Val Lys Gln Met Phe Ala Ser Arg Ala Cys Arg Lys Ser Val
            805   810   815

Met Ile Gly Thr Ala Leu Asn Thr Ser Glu Met Lys Lys Leu Ile Thr
            820   825   830

12

His Met Gly Glu Met Asp His Pro Trp Asn Cys Pro His Gly Arg Pro
     835   840   845

Thr Met Arg His Ile Ala Asn Leu Gly Val Ile Ser Gln Asn
     850   855   860

<210> 17
<211> 2771
<212> DNA
<213> Homo sapiens

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caagagtttg ccgacctaac tcaggttgaa acttttggct ttcgggggga agctctgagc  360
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13

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<210> 18
<211> 932
<212> PRT
<213> Homo sapiens

<400> 18

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Leu Asp Ala Gly Ala Thr Ser Val Asp Val Lys Leu Glu Asn Tyr Gly
          35                  40                  45

Phe Asp Lys Ile Glu Val Arg Asp Asn Gly Glu Gly Ile Lys Ala Val
       50                  55                  60

Asp Ala Pro Val Met Ala Met Lys Tyr Tyr Thr Ser Lys Ile Asn Ser
 65                  70                  75                  80

His Glu Asp Leu Glu Asn Leu Thr Thr Tyr Gly Phe Arg Gly Glu Ala
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Leu Gly Ser Ile Cys Cys Ile Ala Glu Val Leu Ile Thr Thr Arg Thr
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Ala Ala Asp Asn Phe Ser Thr Gln Tyr Val Leu Asp Gly Ser Gly His
          115                 120                 125

Ile Leu Ser Gln Lys Pro Ser His Leu Gly Gln Gly Thr Thr Val Thr
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Ala Leu Arg Leu Phe Lys Asn Leu Pro Val Arg Lys Gln Phe Tyr Ser
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14

Thr Ala Lys Lys Cys Lys Asp Glu Ile Lys Lys Ile Gln Asp Leu Leu
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Met Ser Phe Gly Ile Leu Lys Pro Asp Leu Arg Ile Val Phe Val His
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Asn Lys Ala Val Ile Trp Gln Lys Ser Arg Val Ser Asp His Lys Met
            195   200   205

Ala Leu Met Ser Val Leu Gly Thr Ala Val Met Asn Asn Met Glu Ser
    210   215   220

Phe Gln Tyr His Ser Glu Glu Ser Gln Ile Tyr Leu Ser Gly Phe Leu
225   230   235   240

Pro Lys Cys Asp Ala Asp His Ser Phe Thr Ser Leu Ser Thr Pro Glu
            245   250   255

Arg Ser Phe Ile Phe Ile Asn Ser Arg Pro Val His Gln Lys Asp Ile
            260   265   270

Leu Lys Leu Ile Arg His His Tyr Asn Leu Lys Cys Leu Lys Glu Ser
            275   280   285

Thr Arg Leu Tyr Pro Val Phe Phe Leu Lys Ile Asp Val Pro Thr Ala
    290   295   300

Asp Val Asp Val Asn Leu Thr Pro Asp Lys Ser Gln Val Leu Leu Gln
305   310   315   320

Asn Lys Glu Ser Val Leu Ile Ala Leu Glu Asn Leu Met Thr Thr Cys
            325   330   335

Tyr Gly Pro Leu Pro Ser Thr Asn Ser Tyr Glu Asn Asn Lys Thr Asp
            340   345   350

Val Ser Ala Ala Asp Ile Val Leu Ser Lys Thr Ala Glu Thr Asp Val
    355   360   365

Leu Phe Asn Lys Val Glu Ser Ser Gly Lys Asn Tyr Ser Asn Val Asp
    370   375   380

Thr Ser Val Ile Pro Phe Gln Asn Asp Met His Asn Asp Glu Ser Gly
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15

Gly Tyr Gly His Cys Ser Ser Glu Ile Ser Asn Ile Asp Lys Asn Thr
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Ser Gln Thr Glu Tyr Ser Lys Thr Cys Phe Ile Ser Ser Val Lys His
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Glu Trp Ser Arg Gly Asn Ile Leu Lys Asn Ser Val Gly Glu Asn Ile
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Ser Cys Asn Lys Lys Ser Asn Val Ile Asp Asn Lys Ser Gly Lys Val
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Trp Lys Thr Leu Ser Glu Glu Glu Lys Leu Lys Tyr Glu Glu Lys Ala
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Thr Lys Asp Leu Glu Arg Tyr Asn Ser Gln Met Lys Arg Ala Ile Glu
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Gln Glu Ser Gln Met Ser Leu Lys Asp Gly Arg Lys Lys Ile Lys Pro
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Thr Ser Ala Trp Asn Leu Ala Gln Lys His Lys Leu Lys Thr Ser Leu

16

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Arg Arg Ser Gln Asn Ile Lys Met Val Gln Ile Pro Phe Ser Met Lys
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Asn Leu Lys Ile Asn Phe Lys Lys Gln Asn Lys Val Asp Leu Glu Glu
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Lys Asp Glu Pro Cys Leu Ile His Asn Leu Arg Phe Pro Asp Ala Trp
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Leu Met Thr Ser Lys Thr Glu Val Met Leu Leu Asn Pro Tyr Arg Val
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Glu Glu Ala Leu Leu Phe Lys Arg Leu Leu Glu Asn His Lys Leu Pro
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Arg Tyr Ser Gly Ser Thr Tyr Leu Ser Asp Pro Arg Leu Thr Ala Asn
            805                810                815

Gly Phe Lys Ile Lys Leu Ile Pro Gly Val Ser Ile Thr Glu Asn Tyr
            820                825                830

Leu Glu Ile Glu Gly Met Ala Asn Cys Leu Pro Phe Tyr Gly Val Ala
        835                840                845

Asp Leu Lys Glu Ile Leu Asn Ala Ile Leu Asn Arg Asn Ala Lys Glu
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Val Tyr Glu Cys Arg Pro Arg Lys Val Ile Ser Tyr Leu Glu Gly Glu
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Ala Val Arg Leu Ser Arg Gln Leu Pro Met Tyr Leu Ser Lys Glu Asp
            885                890                895

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17

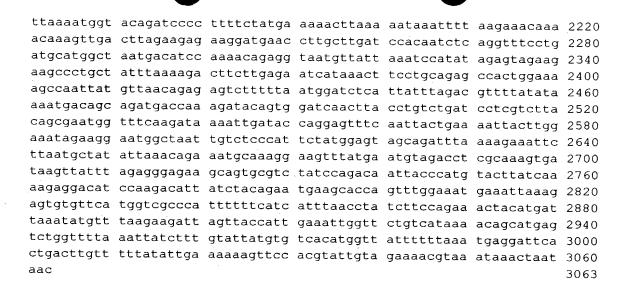915   920   925

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18

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| | | | 20 | | | | | 25 | | | | | 30 | | |

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         35   40   .45

Asp Ala Leu Leu Ala Ala Arg Glu Val Phe Lys Thr Gln Gly Val Ile
    50   55   60

Lys Tyr Met Gly Pro Ala Gly Ala Lys Asn Leu Gln Ser Val Val Leu
65   70   75   80

Ser Lys Met Asn Phe Glu Ser Phe Val Lys Asp Leu Leu Leu Val Arg
            85   90   95

Gln Tyr Arg Val Glu Val Tyr Lys Asn Arg Ala Gly Asn Lys Ala Ser
        100   105   110

Lys Glu Asn Asp Trp Tyr Leu Ala Tyr Lys Ala Ser Pro Gly Asn Leu
        115   120   125

19

Ser Gln Phe Glu Asp Ile Leu Phe Gly Asn Asn Asp Met Ser Ala Ser
    130   135   140

Ile Gly Val Val Gly Val Lys Met Ser Ala Val Asp Gly Gln Arg Gln
145   150   155   160

Val Gly Val Gly Tyr Val Asp Ser Ile Gln Arg Lys Leu Gly Leu Cys
            165   170   175

Glu Phe Pro Asp Asn Asp Gln Phe Ser Asn Leu Glu Ala Leu Leu Ile
            180   185   190

Gln Ile Gly Pro Lys Glu Cys Val Leu Pro Gly Gly Glu Thr Ala Gly
        195   200   205

Asp Met Gly Lys Leu Arg Gln Ile Ile Gln Arg Gly Gly Ile Leu Ile
    210   215   220

Thr Glu Arg Lys Lys Ala Asp Phe Ser Thr Lys Asp Ile Tyr Gln Asp
225   230   235   240

Leu Asn Arg Leu Leu Lys Gly Lys Lys Gly Glu Gln Met Asn Ser Ala
            245   250   255

Val Leu Pro Glu Met Glu Asn Gln Val Ala Val Ser Ser Leu Ser Ala
            260   265   270

Val Ile Lys Phe Leu Glu Leu Leu Ser Asp Asp Ser Asn Phe Gly Gln
        275   280   285

Phe Glu Leu Thr Thr Phe Asp Phe Ser Gln Tyr Met Lys Leu Asp Ile
    290   295   300

Ala Ala Val Arg Ala Leu Asn Leu Phe Gln Gly Ser Val Glu Asp Thr
305   310   315   320

Thr Gly Ser Gln Ser Leu Ala Ala Leu Leu Asn Lys Cys Lys Thr Pro
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Gln Gly Gln Arg Leu Val Asn Gln Trp Ile Lys Gln Pro Leu Met Asp
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Lys Asn Arg Ile Glu Glu Arg Leu Asn Leu Val Glu Ala Phe Val Glu
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Asp Ala Glu Leu Arg Gln Thr Leu Gln Glu Asp Leu Leu Arg Arg Phe
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Pro Asp Leu Asn Arg Leu Ala Lys Lys Phe Gln Arg Gln Ala Ala Asn
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Leu Gln Asp Cys Tyr Arg Leu Tyr Gln Gly Ile Asn Gln Leu Pro Asn
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Val Ile Gln Ala Leu Glu Lys His Glu Gly Lys His Gln Lys Leu Leu
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Leu Ala Val Phe Val Thr Pro Leu Thr Asp Leu Arg Ser Asp Phe Ser
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Lys Phe Gln Glu Met Ile Glu Thr Thr Leu Asp Met Asp Gln Val Glu
      450   455   460

Asn His Glu Phe Leu Val Lys Pro Ser Phe Asp Pro Asn Leu Ser Glu
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Leu Arg Glu Ile Met Asn Asp Leu Glu Lys Lys Met Gln Ser Thr Leu
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Ile Ser Ala Ala Arg Asp Leu Gly Leu Asp Pro Gly Lys Gln Ile Lys
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Leu Asp Ser Ser Ala Gln Phe Gly Tyr Tyr Phe Arg Val Thr Cys Lys
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Glu Glu Lys Val Leu Arg Asn Asn Lys Asn Phe Ser Thr Val Asp Ile
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Gln Lys Asn Gly Val Lys Phe Thr Asn Ser Lys Leu Thr Ser Leu Asn
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Glu Glu Tyr Thr Lys Asn Lys Thr Glu Tyr Glu Glu Ala Gln Asp Ala
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Ile Val Lys Glu Ile Val Asn Ile Ser Ser Gly Tyr Val Glu Pro Met
          580   585   590

Gln Thr Leu Asn Asp Val Leu Ala Gln Leu Asp Ala Val Val Ser Phe
          595   600   605

Ala His Val Ser Asn Gly Ala Pro Val Pro Tyr Val Arg Pro Ala Ile
      610   615   620

Leu Glu Lys Gly Gln Gly Arg Ile Ile Leu Lys Ala Ser Arg His Ala
625   630   635   640

21

Cys Val Glu Val Gln Asp Glu Ile Ala Phe Ile Pro Asn Asp Val Tyr
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Phe Glu Lys Asp Lys Gln Met Phe His Ile Ile Thr Gly Pro Asn Met
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Gly Gly Lys Ser Thr Tyr Ile Arg Gln Thr Gly Val Ile Val Leu Met
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Ala Gln Ile Gly Cys Phe Val Pro Cys Glu Ser Ala Glu Val Ser Ile
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Val Asp Cys Ile Leu Ala Arg Val Gly Ala Gly Asp Ser Gln Leu Lys
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Gly Val Ser Thr Phe Met Ala Glu Met Leu Glu Thr Ala Ser Ile Leu
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Arg Ser Ala Thr Lys Asp Ser Leu Ile Ile Ile Asp Glu Leu Gly Arg
                740   745   750

Gly Thr Ser Thr Tyr Asp Gly Phe Gly Leu Ala Trp Ala Ile Ser Glu
            755   760   765

Tyr Ile Ala Thr Lys Ile Gly Ala Phe Cys Met Phe Ala Thr His Phe
    770   775   780

His Glu Leu Thr Ala Leu Ala Asn Gln Ile Pro Thr Val Asn Asn Leu
785   790   795   800

His Val Thr Ala Leu Thr Thr Glu Glu Thr Leu Thr Met Leu Tyr Gln
                805   810   815

Val Lys Lys Gly Val Cys Asp Gln Ser Phe Gly Ile His Val Ala Glu
            820   825   830

Leu Ala Asn Phe Pro Lys His Val Ile Glu Cys Ala Lys Gln Lys Ala
        835   840   845

Leu Glu Leu Glu Glu Phe Gln Tyr Ile Gly Glu Ser Gln Gly Tyr Asp
    850   855   860

Ile Met Glu Pro Ala Ala Lys Lys Cys Tyr Leu Glu Arg Glu Gln Gly
865   870   875   880

Glu Lys Ile Ile Gln Glu Phe Leu Ser Lys Val Lys Gln Met Pro Phe
                885   890   895

22

Thr Glu Met Ser Glu Glu Asn Ile Thr Ile Lys Leu Lys Gln Leu Lys
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23

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Gly Thr Gly Ile Arg Lys Glu Asp Leu Asp Ile Val Cys Glu Arg Phe
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Tyr Gly Phe Arg Gly Glu Ala Leu Ala Ser Ile Ser His Val Ala His
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24

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Ser Arg Glu Leu Ile Glu Ile Gly Cys Glu Asp Lys Thr Leu Ala Phe
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Lys Met Asn Gly Tyr Ile Ser Asn Ala Asn Tyr Ser Val Lys Lys Cys
                245                   250                   255

Ile Phe Leu Leu Phe Ile Asn His Arg Leu Val Glu Ser Thr Ser Leu
                260                   265                   270

Arg Lys Ala Ile Glu Thr Val Tyr Ala Ala Tyr Leu Pro Lys Asn Thr
        275                   280                   285

His Pro Phe Leu Tyr Leu Ser Leu Glu Ile Ser Pro Gln Asn Val Asp
        290                   295                   300

Val Asn Val His Pro Thr Lys His Glu Val His Phe Leu His Glu Glu
305                   310                   315                   320

Ser Ile Leu Glu Arg Val Gln Gln His Ile Glu Ser Lys Leu Leu Gly
                325                   330                   335

Ser Asn Ser Ser Arg Met Tyr Phe Thr Gln Thr Leu Leu Pro Gly Leu
                340                   345                   350

Ala Gly Pro Ser Gly Glu Met Val Lys Ser Thr Thr Ser Leu Thr Ser
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25

355 360 365

Ser Ser Thr Ser Gly Ser Ser Asp Lys Val Tyr Ala His Gln Met Val
   370   375   380

Arg Thr Asp Ser Arg Glu Gln Lys Leu Asp Ala Phe Leu Gln Pro Leu
385   390   395   400

Ser Lys Pro Leu Ser Ser Gln Pro Gln Ala Ile Val Thr Glu Asp Lys
            405   410   415

Thr Asp Ile Ser Ser Gly Arg Ala Arg Gln Gln Asp Glu Glu Met Leu
            420   425   430

Glu Leu Pro Ala Pro Ala Glu Val Ala Ala Lys Asn Gln Ser Leu Glu
            435   440   445

Gly Asp Thr Thr Lys Gly Thr Ser Glu Met Ser Glu Lys Arg Gly Pro
   450   455   460

Thr Ser Ser Asn Pro Arg Lys Arg His Arg Glu Asp Ser Asp Val Glu
465   470   475   480

Met Val Glu Asp Asp Ser Arg Lys Glu Met Thr Ala Ala Cys Thr Pro
            485   490   495

Arg Arg Arg Ile Ile Asn Leu Thr Ser Val Leu Ser Leu Gln Glu Glu
            500   505   510

Ile Asn Glu Gln Gly His Glu Val Leu Arg Glu Met Leu His Asn His
   515   520   525

Ser Phe Val Gly Cys Val Asn Pro Gln Trp Ala Leu Ala Gln His Gln
   530   535   540

Thr Lys Leu Tyr Leu Leu Asn Thr Thr Lys Leu Ser Glu Glu Leu Phe
545   550   555   560

Tyr Gln Ile Leu Ile Tyr Asp Phe Ala Asn Phe Gly Val Leu Arg Leu
            565   570   575

Ser Glu Pro Ala Pro Leu Phe Asp Leu Ala Met Leu Ala Leu Asp Ser
            580   585   590

Pro Glu Ser Gly Trp Thr Glu Glu Asp Gly Pro Lys Glu Gly Leu Ala
            595   600   605

Glu Tyr Ile Val Glu Phe Leu Lys Lys Lys Ala Glu Met Leu Ala Asp

26

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Tyr Phe Ser Leu Glu Ile Asp Glu Glu Gly Asn Leu Ile Gly Leu Pro
625             630             635             640

Leu Leu Ile Asp Asn Tyr Val Pro Pro Leu Glu Gly Leu Pro Ile Phe
            645             650             655

Ile Leu Arg Leu Ala Thr Glu Val Asn Trp Asp Glu Glu Lys Glu Cys
            660             665             670

Phe Glu Ser Leu Ser Lys Glu Cys Ala Met Phe Tyr Ser Ile Arg Lys
            675             680             685

Gln Tyr Ile Ser Glu Glu Ser Thr Leu Ser Gly Gln Gln Ser Glu Val
        690             695             700

Pro Gly Ser Ile Pro Asn Ser Trp Lys Trp Thr Val Glu His Ile Val
705             710             715             720

Tyr Lys Ala Leu Arg Ser His Ile Leu Pro Pro Lys His Phe Thr Glu
            725             730             735

Asp Gly Asn Ile Leu Gln Leu Ala Asn Leu Pro Asp Leu Tyr Lys Val
            740             745             750

Phe Glu Arg Cys
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<211> 2484
<212> DNA
<213> Homo sapiens

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gagatgattg agaactgttt agatgcaaaa tccacaagta ttcaagtgat tgttaaagag 180
ggaggcctga agttgattca gatccaagac aatggcaccg ggatcaggaa agaagatctg 240
gatattgtat gtgaaaggtt cactactagt aaactgcagt cctttgagga tttagccagt 300
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gacaatattc gctccatctt tggaaatgct gttagtcgag aactgataga aattggatgt 720
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27

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<212> PRT
<213> Homo sapiens

<400> 24

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Ile Ile Thr Ser Val Val Ser Val Val Lys Glu Leu Ile Glu Asn Ser
              20                  25                  30

Leu Asp Ala Gly Ala Thr Ser Val Asp Val Lys Leu Glu Asn Tyr Gly
         35                  40                  45

Phe Asp Lys Ile Glu Val Arg Asp Asn Gly Glu Gly Ile Lys Ala Val
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28

Asp Ala Pro Val Met Ala Met Lys Tyr Tyr Thr Ser Lys Ile Asn Ser
 65   70   75   80

His Glu Asp Leu Glu Asn Leu Thr Thr Tyr Gly Phe Arg Gly Glu Ala
                      85   90   95

Leu Gly Ser Ile Cys Cys Ile Ala Glu Val Leu Ile Thr Thr Arg Thr
                100   105   110

Ala Ala Asp Asn Phe Ser Thr Gln Tyr Val Leu Asp Gly Ser Gly His
          115   120   125

Ile Leu Ser Gln Lys
    130

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<211> 426
<212> DNA
<213> Homo sapiens

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caagagtttg ccgacctaac tcaggttgaa acttttggct ttcggggggga agctctgagc 360
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acttga   426

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<211> 1360
<212> PRT
<213> Homo sapiens

<400> 26
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 1   5   10   15

Leu Ser Asp Ala Asn Lys Ala Ser Ala Arg Ala Ser Arg Glu Gly Gly
          20   25   30

Arg Ala Ala Ala Ala Pro Gly Ala Ser Pro Ser Pro Gly Gly Asp Ala
          35   40   45

Ala Trp Ser Glu Ala Gly Pro Gly Pro Arg Pro Leu Ala Arg Ser Ala
    50   55   60

Ser Pro Pro Lys Ala Lys Asn Leu Asn Gly Gly Leu Arg Arg Ser Val
65   70   75   80

Ala Pro Ala Ala Pro Thr Ser Cys Asp Phe Ser Pro Gly Asp Leu Val
            85   90   95

Trp Ala Lys Met Glu Gly Tyr Pro Trp Trp Pro Cys Leu Val Tyr Asn
            100   105   110

His Pro Phe Asp Gly Thr Phe Ile Arg Glu Lys Gly Lys Ser Val Arg
        115   120   125

Val His Val Gln Phe Phe Asp Asp Ser Pro Thr Arg Gly Trp Val Ser
    130   135   140

Lys Arg Leu Leu Lys Pro Tyr Thr Gly Ser Lys Ser Lys Glu Ala Gln
145   150   155   160

Lys Gly Gly His Phe Tyr Ser Ala Lys Pro Glu Ile Leu Arg Ala Met
            165   170   175

Gln Arg Ala Asp Glu Ala Leu Asn Lys Asp Lys Ile Lys Arg Leu Glu
            180   185   190

Leu Ala Val Cys Asp Glu Pro Ser Glu Pro Glu Glu Glu Glu Glu Met
    195   200   205

Glu Val Gly Thr Thr Tyr Val Thr Asp Lys Ser Glu Glu Asp Asn Glu
    210   215   220

Ile Glu Ser Glu Glu Glu Val Gln Pro Lys Thr Gln Gly Ser Arg Arg
225   230   235   240

Ser Ser Arg Gln Ile Lys Lys Arg Arg Val Ile Ser Asp Ser Glu Ser
            245   250   255

Asp Ile Gly Gly Ser Asp Val Glu Phe Lys Pro Asp Thr Lys Glu Glu
            260   265   270

Gly Ser Ser Asp Glu Ile Ser Ser Gly Val Gly Asp Ser Glu Ser Glu
    275   280   285

Gly Leu Asn Ser Pro Val Lys Val Ala Arg Lys Arg Lys Arg Met Val
    290   295   300

30

Thr Gly Asn Gly Ser Leu Lys Arg Lys Ser Ser Arg Lys Glu Thr Pro
305   310   315   320

Ser Ala Thr Lys Gln Ala Thr Ser Ile Ser Ser Glu Thr Lys Asn Thr
                325   330   335

Leu Arg Ala Phe Ser Ala Pro Gln Asn Ser Glu Ser Gln Ala His Val
                340   345   350

Ser Gly Gly Gly Asp Asp Ser Ser Arg Pro Thr Val Trp Tyr His Glu
            355   360   365

Thr Leu Glu Trp Leu Lys Glu Glu Lys Arg Arg Asp Glu His Arg Arg
        370   375   380

Arg Pro Asp His Pro Asp Phe Asp Ala Ser Thr Leu Tyr Val Pro Glu
385   390   395   400

Asp Phe Leu Asn Ser Cys Thr Pro Gly Met Arg Lys Trp Trp Gln Ile
                405   410   415

Lys Ser Gln Asn Phe Asp Leu Val Ile Cys Tyr Lys Val Gly Lys Phe
                420   425   430

Tyr Glu Leu Tyr His Met Asp Ala Leu Ile Gly Val Ser Glu Leu Gly
        435   440   445

Leu Val Phe Met Lys Gly Asn Trp Ala His Ser Gly Phe Pro Glu Ile
        450   455   460

Ala Phe Gly Arg Tyr Ser Asp Ser Leu Val Gln Lys Gly Tyr Lys Val
465   470   475   480

Ala Arg Val Glu Gln Thr Glu Thr Pro Glu Met Met Glu Ala Arg Cys
                485   490   495

Arg Lys Met Ala His Ile Ser Lys Tyr Asp Arg Val Val Arg Arg Glu
                500   505   510

Ile Cys Arg Ile Ile Thr Lys Gly Thr Gln Thr Tyr Ser Val Leu Glu
                515   520   525

Gly Asp Pro Ser Glu Asn Tyr Ser Lys Tyr Leu Leu Ser Leu Lys Glu
        530   535   540

Lys Glu Glu Asp Ser Ser Gly His Thr Arg Ala Tyr Gly Val Cys Phe
545   550   555   560

31

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Val Asp Thr Ser Leu Gly Lys Phe Phe Ile Gly Gln Phe Ser Asp Asp
                565                 570                 575

Arg His Cys Ser Arg Phe Arg Thr Leu Val Ala His Tyr Pro Pro Val
                580                 585                 590

Gln Val Leu Phe Glu Lys Gly Asn Leu Ser Lys Glu Thr Lys Thr Ile
                595                 600                 605

Leu Lys Ser Ser Leu Ser Cys Ser Leu Gln Glu Gly Leu Ile Pro Gly
            610                 615                 620

Ser Gln Phe Trp Asp Ala Ser Lys Thr Leu Arg Thr Leu Leu Glu Glu
625                 630                 635                 640

Glu Tyr Phe Arg Glu Lys Leu Ser Asp Gly Ile Gly Val Met Leu Pro
                645                 650                 655

Gln Val Leu Lys Gly Met Thr Ser Glu Ser Asp Ser Ile Gly Leu Thr
                660                 665                 670

Pro Gly Glu Lys Ser Glu Leu Ala Leu Ser Ala Leu Gly Gly Cys Val
            675                 680                 685

Phe Tyr Leu Lys Lys Cys Leu Ile Asp Gln Glu Leu Leu Ser Met Ala
    690                 695                 700

Asn Phe Glu Glu Tyr Ile Pro Leu Asp Ser Asp Thr Val Ser Thr Thr
705                 710                 715                 720

Arg Ser Gly Ala Ile Phe Thr Lys Ala Tyr Gln Arg Met Val Leu Asp
                725                 730                 735

Ala Val Thr Leu Asn Asn Leu Glu Ile Phe Leu Asn Gly Thr Asn Gly
            740                 745                 750

Ser Thr Glu Gly Thr Leu Leu Glu Arg Val Asp Thr Cys His Thr Pro
    755                 760                 765

Phe Gly Lys Arg Leu Leu Lys Gln Trp Leu Cys Ala Pro Leu Cys Asn
    770                 775                 780

His Tyr Ala Ile Asn Asp Arg Leu Asp Ala Ile Glu Asp Leu Met Val
785                 790                 795                 800

Val Pro Asp Lys Ile Ser Glu Val Val Glu Leu Leu Lys Lys Leu Pro
                805                 810                 815
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32

Asp Leu Glu Arg Leu Leu Ser Lys Ile His Asn Val Gly Ser Pro Leu
             820   825   830

Lys Ser Gln Asn His Pro Asp Ser Arg Ala Ile Met Tyr Glu Glu Thr
         835   840   845

Thr Tyr Ser Lys Lys Lys Ile Ile Asp Phe Leu Ser Ala Leu Glu Gly
     850   855   860

Phe Lys Val Met Cys Lys Ile Ile Gly Ile Met Glu Glu Val Ala Asp
865   870   875   880

Gly Phe Lys Ser Lys Ile Leu Lys Gln Val Ile Ser Leu Gln Thr Lys
             885   890   895

Asn Pro Glu Gly Arg Phe Pro Asp Leu Thr Val Glu Leu Asn Arg Trp
             900   905   910

Asp Thr Ala Phe Asp His Glu Lys Ala Arg Lys Thr Gly Leu Ile Thr
         915   920   925

Pro Lys Ala Gly Phe Asp Ser Asp Tyr Asp Gln Ala Leu Ala Asp Ile
     930   935   940

Arg Glu Asn Glu Gln Ser Leu Leu Glu Tyr Leu Glu Lys Gln Arg Asn
945   950   955   960

Arg Ile Gly Cys Arg Thr Ile Val Tyr Trp Gly Ile Gly Arg Asn Arg
             965   970   975

Tyr Gln Leu Glu Ile Pro Glu Asn Phe Thr Thr Arg Asn Leu Pro Glu
             980   985   990

Glu Tyr Glu Leu Lys Ser Thr Lys Lys Gly Cys Lys Arg Tyr Trp Thr
         995   1000   1005

Lys Thr Ile Glu Lys Lys Leu Ala Asn Leu Ile Asn Ala Glu Glu Arg
     1010   1015   1020

Arg Asp Val Ser Leu Lys Asp Cys Met Arg Arg Leu Phe Tyr Asn Phe
1025   1030   1035   1040

Asp Lys Asn Tyr Lys Asp Trp Gln Ser Ala Val Glu Cys Ile Ala Val
             1045   1050   1055

Leu Asp Val Leu Leu Cys Leu Ala Asn Tyr Ser Arg Gly Gly Asp Gly
         1060   1065   1070

33

Pro Met Cys Arg Pro Val Ile Leu Leu Pro Glu Asp Thr Pro Pro Phe
     1075   1080   1085

Leu Glu Leu Lys Gly Ser Arg His Pro Cys Ile Thr Lys Thr Phe Phe
     1090   1095   1100

Gly Asp Asp Phe Ile Pro Asn Asp Ile Leu Ile Gly Cys Glu Glu Glu
1105   1110   1115   1120

Glu Gln Glu Asn Gly Lys Ala Tyr Cys Val Leu Val Thr Gly Pro Asn
               1125   1130   1135

Met Gly Gly Lys Ser Thr Leu Met Arg Gln Ala Gly Leu Leu Ala Val
               1140   1145   1150

Met Ala Gln Met Gly Cys Tyr Val Pro Ala Glu Val Cys Arg Leu Thr
          1155   1160   1165

Pro Ile Asp Arg Val Phe Thr Arg Leu Gly Ala Ser Asp Arg Ile Met
     1170   1175   1180

Ser Gly Glu Ser Thr Phe Phe Val Glu Leu Ser Glu Thr Ala Ser Ile
1185   1190   1195   1200

Leu Met His Ala Thr Ala His Ser Leu Val Leu Val Asp Glu Leu Gly
               1205   1210   1215

Arg Gly Thr Ala Thr Phe Asp Gly Thr Ala Ile Ala Asn Ala Val Val
          1220   1225   1230

Lys Glu Leu Ala Glu Thr Ile Lys Cys Arg Thr Leu Phe Ser Thr His
     1235   1240   1245

Tyr His Ser Leu Val Glu Asp Tyr Ser Gln Asn Val Ala Val Arg Leu
     1250   1255   1260

Gly His Met Ala Cys Met Val Glu Asn Glu Cys Glu Asp Pro Ser Gln
1265   1270   1275   1280

Glu Thr Ile Thr Phe Leu Tyr Lys Phe Ile Lys Gly Ala Cys Pro Lys
               1285   1290   1295

Ser Tyr Gly Phe Asn Ala Ala Arg Leu Ala Asn Leu Pro Glu Glu Val
          1300   1305   1310

Ile Gln Lys Gly His Arg Lys Ala Arg Glu Phe Glu Lys Met Asn Gln
     1315   1320   1325

34

Ser Leu Arg Leu Phe Arg Glu Val Cys Leu Ala Ser Glu Arg Ser Thr
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Val Asp Ala Glu Ala Val His Lys Leu Leu Thr Leu Ile Lys Glu Leu
1345   1350   1355   1360

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<212> DNA
<213> Homo sapiens

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35

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<213> Homo sapiens

<400> 28

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Ala Pro Ala Arg Gln Ala Val Leu Ser Arg Phe Phe Gln Ser Thr Gly
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Ser Leu Lys Ser Thr Ser Ser Ser Thr Gly Ala Ala Asp Gln Val Asp
        35                  40                  45

Pro Gly Ala Ala Ala Ala Ala Ala Pro Pro Ala Pro Ala Phe Pro Pro
        50                  55                  60

Gln Leu Pro Pro His Val Ala Thr Glu Ile Asp Arg Arg Lys Lys Arg
65                  70                  75                  80

Pro Leu Glu Asn Asp Gly Pro Val Lys Lys Lys Val Lys Lys Val Gln
                85                  90                  95

Gln Lys Glu Gly Gly Ser Asp Leu Gly Met Ser Gly Asn Ser Glu Pro
            100                 105                 110

Lys Lys Cys Leu Arg Thr Arg Asn Val Ser Lys Ser Leu Glu Lys Leu
        115                 120                 125

Lys Glu Phe Cys Cys Asp Ser Ala Leu Pro Gln Ser Arg Val Gln Thr
    130                 135                 140

Glu Ser Leu Gln Glu Arg Phe Ala Val Leu Pro Lys Cys Thr Asp Phe
145                 150                 155                 160

Asp Asp Ile Ser Leu Leu His Ala Lys Asn Ala Val Ser Ser Glu Asp
            165                 170                 175

Ser Lys Arg Gln Ile Asn Gln Lys Asp Thr Thr Leu Phe Asp Leu Ser
        180                 185                 190

Gln Phe Gly Ser Ser Asn Thr Ser His Glu Asn Leu Gln Lys Thr Ala
        195                 200                 205

Ser Lys Ser Ala Asn Lys Arg Ser Lys Ser Ile Tyr Thr Pro Leu Glu
    210                 215                 220

Leu Gln Tyr Ile Glu Met Lys Gln Gln His Lys Asp Ala Val Leu Cys
225                 230                 235                 240

Val Glu Cys Gly Tyr Lys Tyr Arg Phe Phe Gly Glu Asp Ala Glu Ile
            245                 250                 255
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37

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Ala Ala Arg Glu Leu Asn Ile Tyr Cys His Leu Asp His Asn Phe Met
            260                 265             270

Thr Ala Ser Ile Pro Thr His Arg Leu Phe Val His Val Arg Arg Leu
            275                 280             285

Val Ala Lys Gly Tyr Lys Val Gly Val Val Lys Gln Thr Glu Thr Ala
            290                 295             300

Ala Leu Lys Ala Ile Gly Asp Asn Arg Ser Ser Leu Phe Ser Arg Lys
305                 310                 315                 320

Leu Thr Ala Leu Tyr Thr Lys Ser Thr Leu Ile Gly Glu Asp Val Asn
            325                 330             335

Pro Leu Ile Lys Leu Asp Asp Ala Val Asn Val Asp Glu Ile Met Thr
            340                 345             350

Asp Thr Ser Thr Ser Tyr Leu Leu Cys Ile Ser Glu Asn Lys Glu Asn
            355                 360             365

Val Arg Asp Lys Lys Lys Gly Asn Ile Phe Ile Gly Ile Val Gly Val
    370                 375             380

Gln Pro Ala Thr Gly Glu Val Val Phe Asp Ser Phe Gln Asp Ser Ala
385                 390                 395                 400

Ser Arg Ser Glu Leu Glu Thr Arg Met Ser Ser Leu Gln Pro Val Glu
            405                 410             415

Leu Leu Leu Pro Ser Ala Leu Ser Glu Gln Thr Glu Ala Leu Ile His
            420                 425             430

Arg Ala Thr Ser Val Ser Val Gln Asp Asp Arg Ile Arg Val Glu Arg
            435                 440             445

Met Asp Asn Ile Tyr Phe Glu Tyr Ser His Ala Phe Gln Ala Val Thr
    450                 455             460

Glu Phe Tyr Ala Lys Asp Thr Val Asp Ile Lys Gly Ser Gln Ile Ile
465                 470                 475                 480

Ser Gly Ile Val Asn Leu Glu Lys Pro Val Ile Cys Ser Leu Ala Ala
            485                 490             495

Ile Ile Lys Tyr Leu Lys Glu Phe Asn Leu Glu Lys Met Leu Ser Lys
            500                 505             510
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Pro Glu Asn Phe Lys Gln Leu Ser Ser Lys Met Glu Phe Met Thr Ile
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Asn Gly Thr Thr Leu Arg Asn Leu Glu Ile Leu Gln Asn Gln Thr Asp
    530                 535                 540

Met Lys Thr Lys Gly Ser Leu Leu Trp Val Leu Asp His Thr Lys Thr
545                 550                 555                     560

Ser Phe Gly Arg Arg Lys Leu Lys Lys Trp Val Thr Gln Pro Leu Leu
                565                 570                 575

Lys Leu Arg Glu Ile Asn Ala Arg Leu Asp Ala Val Ser Glu Val Leu
            580                 585                 590

His Ser Glu Ser Ser Val Phe Gly Gln Ile Glu Asn His Leu Arg Lys
        595                 600                 605

Leu Pro Asp Ile Glu Arg Gly Leu Cys Ser Ile Tyr His Lys Lys Cys
    610                 615                 620

Ser Thr Gln Glu Phe Phe Leu Ile Val Lys Thr Leu Tyr His Leu Lys
625                 630                 635                     640

Ser Glu Phe Gln Ala Ile Ile Pro Ala Val Asn Ser His Ile Gln Ser
            645                 650                 655

Asp Leu Leu Arg Thr Val Ile Leu Glu Ile Pro Glu Leu Leu Ser Pro
            660                 665                 670

Val Glu His Tyr Leu Lys Ile Leu Asn Glu Gln Ala Ala Lys Val Gly
        675                 680                 685

Asp Lys Thr Glu Leu Phe Lys Asp Leu Ser Asp Phe Pro Leu Ile Lys
    690                 695                 700

Lys Arg Lys Asp Glu Ile Gln Gly Val Ile Asp Glu Ile Arg Met His
705                 710                 715                     720

Leu Gln Glu Ile Arg Lys Ile Leu Lys Asn Pro Ser Ala Gln Tyr Val
            725                 730                 735

Thr Val Ser Gly Gln Glu Phe Met Ile Glu Ile Lys Asn Ser Ala Val
            740                 745                 750

Ser Cys Ile Pro Thr Asp Trp Val Lys Val Gly Ser Thr Lys Ala Val
    755                 760                 765
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Ser Arg Phe His Ser Pro Phe Ile Val Glu Asn Tyr Arg His Leu Asn
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Gln Leu Arg Glu Gln Leu Val Leu Asp Cys Ser Ala Glu Trp Leu Asp
785             790             795                 800

Phe Leu Glu Lys Phe Ser Glu His Tyr His Ser Leu Cys Lys Ala Val
            805             810             815

His His Leu Ala Thr Val Asp Cys Ile Phe Ser Leu Ala Lys Val Ala
        820             825             830

Lys Gln Gly Asp Tyr Cys Arg Pro Thr Val Gln Glu Glu Arg Lys Ile
        835             840             845

Val Ile Lys Asn Gly Arg His Pro Val Ile Asp Val Leu Leu Gly Glu
    850             855             860

Gln Asp Gln Tyr Val Pro Asn Asn Thr Asp Leu Ser Glu Asp Ser Glu
865             870             875             880

Arg Val Met Ile Ile Thr Gly Pro Asn Met Gly Gly Lys Ser Ser Tyr
            885             890             895

Ile Lys Gln Val Ala Leu Ile Thr Ile Met Ala Gln Ile Gly Ser Tyr
        900             905             910

Val Pro Ala Glu Glu Ala Thr Ile Gly Ile Val Asp Gly Ile Phe Thr
        915             920             925

Arg Met Gly Ala Ala Asp Asn Ile Tyr Lys Gly Arg Ser Thr Phe Met
    930             935             940

Glu Glu Leu Thr Asp Thr Ala Glu Ile Ile Arg Lys Ala Thr Ser Gln
945             950             955             960

Ser Leu Val Ile Leu Asp Glu Leu Gly Arg Gly Thr Ser Thr His Asp
            965             970             975

Gly Ile Ala Ile Ala Tyr Ala Thr Leu Glu Tyr Phe Ile Arg Asp Val
            980             985             990

Lys Ser Leu Thr Leu Phe Val Thr His Tyr Pro Pro Val Cys Glu Leu
        995             1000            1005

Glu Lys Asn Tyr Ser His Gln Val Gly Asn Tyr His Met Gly Phe Leu
    1010            1015            1020
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40

Val Ser Glu Asp Glu Ser Lys Leu Asp Pro Gly Ala Ala Glu Gln Val
1025   1030   1035   1040

Pro Asp Phe Val Thr Phe Leu Tyr Gln Ile Thr Arg Gly Ile Ala Ala
         1045   1050   1055

Arg Ser Tyr Gly Leu Asn Val Ala Lys Leu Ala Asp Val Pro Gly Glu
         1060   1065   1070

Ile Leu Lys Lys Ala Ala His Lys Ser Lys Glu Leu Glu Gly Leu Ile
         1075   1080   1085

Asn Thr Lys Arg Lys Arg Leu Lys Tyr Phe Ala Lys Leu Trp Thr Met
      1090   1095   1100

His Asn Ala Gln Asp Leu Gln Lys Trp Thr Glu Glu Phe Asn Met Glu
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Glu Thr Gln Thr Ser Leu Leu His
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<212> DNA
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cagaagaaag aagagaccat ggaaaatga tgggcctgtt aaaaagaaag taaagaaagt   300
ccaacaaaag gaaggaggaa gtgatctggg aatgtctggc aactctgagc caaagaaatg   360
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41

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42

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<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:oligonucleotide
     primer

<400> 30
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<210> 31
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<210> 33
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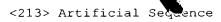
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<210> 34
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<210> 35
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<210> 36
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<210> 37
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<210> 38
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<210> 39
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<210> 42
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<210> 43
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